

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 2, 2017/2018

**TSW 3241 – SEMANTIC WEB TECHNOLOGY**  
(All sections / Groups)

8 March 2018  
2:30pm – 4:30pm  
(2 Hours)

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### INSTRUCTIONS TO STUDENT

1. This Question paper consists of **NINE** pages, which includes the front cover, with **FIVE** Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers in the answer booklet provided, and start each question on a new page.

**Question 1** [10 marks]

(a) Explain the following terminology:

- (i) Semantic technology
- (ii) Partonomy

[2 marks]

(b) The World Wide Web (WWW) is penetrating human society.

- (i) Two domains of WWW application are administration and social contacts. List and then explain an example of WWW application in each of these two domains.

[4 marks]

- (ii) Explain TWO limitations of WWW.

[2 marks]

(c) A schema knowledge can be represented as either a taxonomy or a partonomy. Provide an example of taxonomy and an example of partonomy.

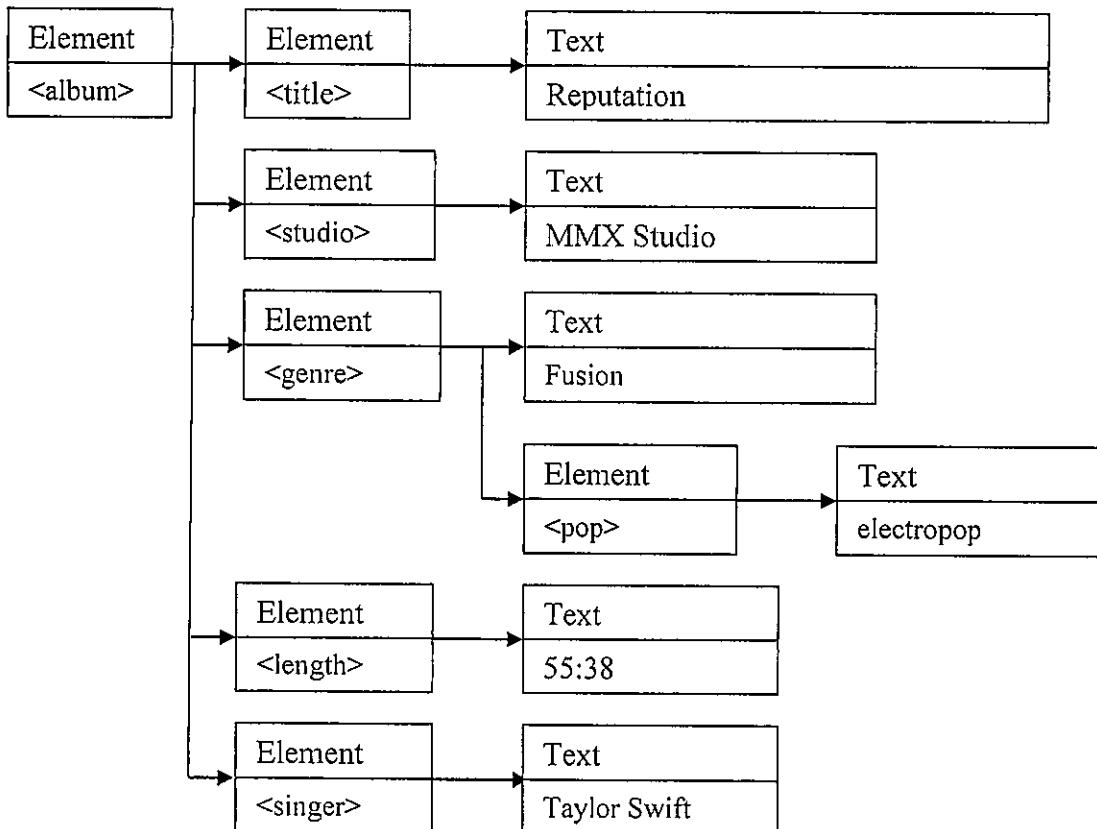
[2 marks]

**Continued...**

**Question 2** [10 marks]

- (a) A claim is made that “XML revolutionises software development”.
- (i) List an advantage of using Extensible Markup Language (XML)? [1 mark]
- (ii) What are THREE features of a well-formed XML document? [3 marks]

- (b) A tree structure of XML is given below:



- (i) Convert the tree structure above into an XML document. Assume in this document, a tag can bear with only an attribute. [4 marks]
- (ii) By referring to your answer from (i),
- assign a tag *length* with an attribute name *duration*.
  - assign a tag *singer* with an attribute name *name*.
- What version is this XML document? [2 marks]

**Continued...**

**Question 3** [10 marks]

- (a) A document in a Resource Description Framework (RDF) is written as follows:

```

<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:iswww="http://un.org/#"
>

<rdf:Description rdf:about="http://un.org/#portugal">
  <rdf:type rdf:resource="http://un.org/#country"> />
</rdf:Description>

<rdf:Description rdf:about="http://un.org/#capital_of">
  <rdf:type
    rdf:resource="http://www.w3.org/1999/02/22-rdf-syntax-ns#Property" />
  <rdfs:domain rdf:resource="http://un.org/#city" />
  <rdfs:range rdf:resource="http://un.org/#country" />
</rdf:Description>

<rdf:Description rdf:about="http://un.org/#country">
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class" />
  <rdfs:label xml:lang="pt">Pais</rdfs:label>
</rdf:Description>

<rdf:Description rdf:about="http://un.org/#lisboa">
  <rdfs:label xml:lang="en">Lisbon</rdfs:label>
  <rdf:type rdf:resource="http://un.org/#city" />
  <iswww: city_of rdf:resource="http://un.org/#" />
</rdf:Description>

<rdf:Description rdf:about="http://un.org/#city">
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class" />
  <rdfs:label xml:lang="pt">Citade</rdfs:label>
</rdf:Description>

</rdf:RDF>
```

- (i) Describe in natural language the content of this document. [3 marks]
- (ii) Draw the graph representation of this document. [5 marks]

**Continued...**

**Question 3 (continued...)**

(b) Given the following listing:

```
<rdf:RDF
    xmlns:rdf = "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:zoo = "http://tourism.org/botanical"
    >
    <rdf:Description rdf:about = "http://tourism.org/botanical/plant-1000">
        <botanical:scientificName> Hibiscus rosa-sinensis </botanical:scientificName>
    </rdf:Description>
</rdf:RDF>
```

Write the listing above in Turtle syntax.

[2 marks]

**Continued...**

**Question 4** [10 marks]

- (a) One of the species of Web Ontology Language (OWL) is OWL Lite.
- (i) What is this OWL Lite? [1 mark]
- (ii) State two advantages of OWL Lite. [2 marks]
- (iii) State one disadvantage of OWL Lite. [1 mark]
- (b) Another species of OWL is OWL Description Logic (OWL DL). Use OWL DL to model the following sentences.
- (i) The class **whale** is a subclass of **mammal**. [2 marks]
- (ii) Every bread has at least three toppings. [4 marks]

**Continued...**

**Question 5** [10 marks]

- (a) Given the following predicate logic formulae:

$$\text{Lady}(x) \wedge \text{Tea}(y) \wedge \text{Loves}(x, y) \wedge \text{Loves}(x, \text{coffee}) \rightarrow \text{Smart}(x) \wedge \text{Hardworking}(x)$$

- (i) Translate the formulae into a datalog rule. [2 marks]
- (ii) Translate the formulae into SROIQ. [2 marks]

- (b) Given the following knowledgebase:

Member  $\subseteq \exists \text{presents}.\text{Workshop}$   
 Workshop  $\subseteq \exists \text{presentedBy}.(\text{Member} \cap \text{Diligent})$   
 Member(aMember)  
 $\neg \text{Diligent}(\text{aMember})$

- (i) Translate the knowledgebase above into a datalog program. [4 marks]
- (ii) Identify which of the resulting rules from (b)(i) are datalog rules. Explain why. [2 marks]

**Continued...**

**APPENDIX****1. Overview of OWL 1 Language Constructs****1.1 Header**

rdfs:comment	owl:versionInfo	owl:DeprecatedClass
rdfs:seeAlso	owl:priorversion	owl:DeprecatedProperty
rdfs:label	owl:backwardCompatibleWith	owl:imports
rdfs:isDefinedBy	owl:incompatibleWith	

**1.2 Relations Between Individuals**

owl:sameAs	owl:differentFrom
owl:AllDifferent	together with

**1.3 Class Constructs and Relationships**

owl:Class	owl:Thing	owl:Nothing
rdfs:subClassOf	owl:disjointWith*	owl:equivalentClass
owl:intersectionOf	owl:unionOf*	owl:complementOf*

**1.4 Role Constructors, Relationships and Characteristics**

owl:ObjectProperty	owl:FunctionalProperty	rdfs:range
rdfs:subPropertyOf	owl:inverseOf	owl:SymmetricProperty
rdfs:domain	owl:DatatypeProperty	owl:InverseFunctionalProperty
owl:TransitiveProperty	owl:equivalentProperty	

**1.5 Allowed Datatypes**

The standard only requires the support of xsd:string and xsd:integer

xsd:string	xsd:boolean	xsd:decimal
xsd:float	xsd:double	xsd:dateTime
xsd:time	xsd:date	xsd:gYearMonth
xsd:gYear	xsd:gMonthDay	xsd:gDay
xsd:gMonth	xsd:hexBinary	xsd:base64Binary
xsd:anyURI	xsd:token	xsd:normalizedString
xsd:language	xsd:NMTOKEN	xsd:positiveInteger
xsd:NCName	xsd:Name	xsd:nonPositiveInteger
xsd:long	xsd:int	xsd:negativeInteger
xsd:short	xsd:byte	xsd:nonNegativeInteger
xsd:unsignedLong	xsd:unsignedInt	xsd:unsignedShort
xsd:unsignedByte	xsd:integer	

**Continued...**

## 2. Overview of Additional OWL 2 Language Constructs

### 2.1 Declaring Individuals

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owl:NamedIndividual

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### 2.2 Class Relationships

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owl:disjointUnionOf	owl:AllDisjointClasses	owl:members
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### 2.3 Role Characteristics and Relationships

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owl:AsymmetricProperty	owl:ReflexiveProperty
owl:IrreflexiveProperty	owl:topDataProperty
owl:topObjectProperty	owl:bottomDataProperty
owl:bottomObjectProperty	owl:AllDisjointProperty
owl:propertyDisjointWith	owl:hasKey
owl:propertyChainAxiom	owl:inverseOf

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### 2.4 Role Restrictions

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owl:maxQualifiedCardinality	owl: minQualifiedCardinality
owl:qualifiedCardinality	owl:onClass
owl:onDataRange	owl:hasSelf

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### 2.5 Role Assignments

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owl:NegativePropertyAssertion	owl: sourceIndividual
owl:assertionProperty	owl:targetIndividual
owl:targetValue	

---

### 2.6 Datatype Restrictions

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owl:onDataType	owl: withRestrictions
owl:datatypeComplementOf	

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### 2.7 Additional Datatypes

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owl:real	owl:rational	rdf:PlainLiteral
rdf:XMLLiteral	xsd:dateTimeStamp	

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**End of Paper**